We claim:

1. An apparatus for acquiring off-axis X-ray images of a plurality of regions of interest, comprising:

a source of radiation, the source producing a beam of radiation;

a surface to support at least a subset of the plurality of regions of interest; and

a X-ray detector located to simultaneously receive portions of the beam that have passed through the subset of the plurality of regions of interest, the X-ray detector producing from the received portions of the beam an electronic representation of an image for each region of interest in the subset of the plurality of regions of interest;

wherein at least one of the source, the surface, and the detector may be moveable to position the regions of interest within the beam.

2. The apparatus of claim 1 wherein the electronic representations of a region of interest are transferred from the detector to a processor for processing into images of the region of interest.

3. The apparatus of claim 2 wherein the resulting images can be viewed on a display.

4. The apparatus of claim 1 further comprising a processor to combine at least two digital representations of a region of interest to produce a tomosynthetic image.

5. The apparatus of claim 1 wherein the detector comprises an amorphous silicon screen.

6. The apparatus of claim 5 wherein the detector further comprises a coating of cesium iodide.

7. The apparatus of claim 1 wherein the detector comprises a cesium iodide

screen.

8. The apparatus of claim 7 wherein the detector further includes a lens or fiber optic bundle for providing a light image to a CCD camera.

9. The apparatus of claim 8 wherein the output of the CCD camera is provided to a processor for processing into images of the region of interest.

10. The apparatus of claim 1 wherein the source of radiation is a non-steerable x-ray source.

11. The apparatus of claim 1 wherein the support surface may be moveable to position the regions of interest within the beam.

12. The apparatus of claim 1 wherein the source and the detector may be moveable to position the regions within the beam.

13. A method for acquiring off-axis X-ray image data for a plurality of regions of interest, comprising the steps of

locating the plurality of regions of interest within a beam of radiation, at least a portion of the beam passing through the regions of interest;

simultaneously detecting the portion of the beam for the plurality of regions of interest and producing image data corresponding to each of the regions of interest;

adjusting the location of the plurality of regions of interest, at least a subset of the plurality of regions of interest remaining within the beam;

repeating the step of simultaneously detecting and producing image data; and

combining image data for at least one region of interest to generate a tomosynthetic image of the region of interest.

14. The method of claim 13 wherein the combining step comprises aligning

the image data for each region by locating one or more in-view fiducials in each region of interest.

15. The method of claim 13 wherein the combining step comprises aligning the image data for each region by monitoring an encoder output associated with a support for adjusting the location of the plurality of regions of interest.

16. An apparatus for acquiring off-axis X-ray images of a plurality of regions of interest, comprising:

a non-steerable source of radiation that produces a beam;

a surface to support at least a subset of the plurality of regions of interest; and

a detector located to receive portions of the beam that pass through the subset and to simultaneously produce an electronic representation of an image for each region of interest in the subset;

wherein at least one of the source, the surface, and the detector may be moveable to position the regions of interest within the beam.

17. The apparatus of claim 16 wherein the support comprises an x-y table.

18. The apparatus of claim 17 wherein the support further comprises an encoder coupled to the x-y table, the encoder providing the x-y table with a positional accuracy required to correctly combine separate images.

19. The apparatus of claim 18 wherein the positional accuracy of the table is better than about +/- 2 pixels.

20. The apparatus of claim 16 wherein at least one of the source and the detector is movable along the z-axis.

21. The apparatus of claim 16 wherein the detector converts the received

portion of the beam into an image signal.

22. The apparatus of claim 21 wherein the image signal is transferred from the detector to an image processing system for processing into images of the region of interest.

23. The apparatus of claim 22 further comprising a processor for controlling the positioning of the plurality of regions of interest within the beam and the processing of the digital image signals into images of the regions of interest.

24. The apparatus of claim 22 wherein the resulting images can be viewed on a display.

25. The apparatus of claim 16 wherein the support surface may be moveable to position the regions of interest within the beam.

26. An apparatus for acquiring off-axis X-ray images of test objects comprising:

an X-ray source for producing a steerable electron beam from a number of different positions along a horizontal path perpendicular to a vertical axis, each position being at an angle from the vertical axis; and

a high-resolution detector positioned to receive X-rays that are transmitted through at least two regions of interest for the test object from each of the positions and to produce electronic representations of acquired off-axis images corresponding to the regions of interest.

27. The apparatus of claim 26 wherein the control system directs a second electron beam to a second region of interest on the test object at each position.

28. The apparatus of claim 26 wherein the image of the first region of interest

corresponding to one position and the image of the second region of interest corresponding to another position are acquired sequentially.

29. The apparatus of claim 26 wherein the detector includes a screen made of cesium iodide.

30. The apparatus of claim 26 wherein the detector further includes a camera.

31. A method for simultaneously acquiring a plurality of off-axis X-ray images comprising:

placing a test object with at least two regions of interest on an inspection plane;

directing X-ray beams to the regions of interest, the X-ray beams being directed off-axis with respect to a vertical axis through the inspection plane;

receiving on a detector X-rays that are transmitted through the regions of interest; and

simultaneously producing electronic representations of acquired off-axis images corresponding to the regions of interest.

32. The method of claim 31 wherein the directing step comprises generating X-ray beams from a non-steerable source of radiation.

33. The method of claim 31 wherein the producing step further comprises aligning the acquired off-axis images for each region of interest by locating one or more in-view fiducials in each image of the respective region.

34. A method acquiring a plurality of off-axis X-ray images comprising:

placing a test object with at least two regions of interest on an inspection plane;

producing a steerable X-ray beam from a number of different positions along a horizontal path perpendicular to a vertical axis;

directing an X-ray beam to a first region of interest;

receiving on a detector X-rays that are transmitted through the first region of interest;

directing an X-ray beam to a second region of interest;

receiving on the detector X-rays that are transmitted through the second region of interest; and

producing electronic representations of acquired off-axis images corresponding to the regions of interest.